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Copper-catalyzed enantioselective conjugate addition of Grignard reagent to non-activated acceptors

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List of abbreviations

ACA: asymmetric conjugate addition

AgOTf: silver(I) trifluorosulfonate

CA: conjugate addition

calcd.: calculated

CuOTf: copper(I) trifluorosulfonate

CuTc: copper(I) thiophene-2-carboxylate

DCC: dicyclohexylcarbodiimide solution

DCM: dichloromethane

DMF: *N,N*-dimethylformamide

DMPU: *N,N'*-dimethylpropyleneurea

DMSO: dimethyl sulfoxide

ee: enantiomeric excess

equiv.: equivalent

ESI: electrospray ionization

HATU: hexafluorophosphate azabenzotriazole tetramethyl uronium

HMBC: heteronuclear multiple bond correlation spectroscopy

HMPC: hexamethylphosphoramide

HOESY: heteronuclear overhauser effect spectroscopy

HPLC: high performance liquid chromatography

HRMS: high-resolution mass spectrometry

HSQC: heteronuclear single quantum coherence spectroscopy

LA: Lewis acid

LDA: lithium diisopropylamide

LUMO: lowest unoccupied molecular orbital

m-CPBA: 3-chloroperbenzoic acid

2-Me-THF: 2-methyltetrahydrofuran

Mes: methanesulfonyl

MTBE: methyl-*tert*-butylether

NMR: nuclear magnetic resonance
NOE: nuclear overhauser effect
PMA: phosphomolybdic acid
ppm: parts per million
Rac: racemic
r.d.s.: rate determine step
ROESY: rotating frame overhauser effect spectroscopy
RT: room temperature
Sc(OTf)₃: scandium(III) trifluorosulfonate
TADDOL: $\alpha,\alpha,\alpha,\alpha$ -tetraaryl-1,3-dioxolane-4,5-dimethanol
TBDPSOTf: *tert*-butyl-diphenylsilyl trifluorosulfonate
TBS: *tert*-butyl-dimethylsilyl
TBSTf: *tert*-butyl-dimethylsilyl trifluorosulfonate
TESNTf₂: *N*-Trimethylsilyl-bis(trifluoromethanesulfonyl)imide
TESOTf: triethylsilyl trifluorosulfonate
TfOH: trifluoromethanesulfonic acid
TIPSOTf: tri-*iso*-propylsilyl trifluorosulfonate
THF: tetrahydrofuran
TLC: thin layer chromatography
TMS: trimethylsilyl
TMSBr: trimethylsilyl bromide
TMSCl: trimethylsilyl chloride
TMSCN: trimethylsilyl cyanide
TMSOTf: trimethylsilyl trifluorosulfonate
TOCSY: total correlation spectroscopy
Tol-Binap: 2,2'-Bis(di-*p*-tolylphosphino)-1,1'-binaphthyl
UV: ultraviolet
Zn(OTf)₂: zinc trifluorosulfonate